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NOTES AND LITERATURE

MARINE BIOLOGY

Papers from the Tortugas Laboratory of the Carnegie Institution of Washington, Vol. I, 191 pp., Vol. II, 325 pp. (Carnegie Institution of Washington Publications No. 102 and 103, 1908.)

The first collection of memoirs published in the name of the laboratory itself, from this practically tropical marine station, is highly creditable to the students who made the researches, to the director of the laboratory, Dr. A. G. Mayer, and to the great Institution which, on the financial side, has made the studies possible. Still more it is an impressive embodiment of the perception and conception that the sea is a vast, inexhaustible mine of the raw material out of which biological science is constructed; and that this material can be transformed into finished, useful product only on the ground to which it is native. Such writings drive home the truth with special force that would we really know nature we must go where nature is; we must study her *in her home*.

The two volumes contain nineteen papers written by fourteen naturalists, and the range of topics is almost as wide as the field of marine zoology. Yet nearly every one of these papers contains something, some of them many things, that a biologist who daily breathes the air of a large, expansive biological philosophy will want to make memorandum of for future use.

The apparel of the matter presented approaches, though does not reach, perfection. The most serious defect in the outer garments is the lack of aid to general consultation. Not only is there no alphabetical index, but the list of papers at the beginning of each volume is without page references, so one must hunt through the volume for any paper he may want to consult. The principle of the greatest good to the greatest number is against allowing scientific books, especially, to go out wanting such useful incidentals as these. The numberings and letterings of some of the illustrations are too small and indistinct to be easily read by artificial light.

Defects in some of the inner garments are more unfortunate than any in the outer. It is not necessary as one of the authors seems to think, to "investigate into" a subject. To just investi-

gate it is enough. "Further observations are needed . . . especially with reference as to whether," etc. Why the "as to"? This sentence is bungling. But worse than bungling is the statement that "organic data function" in controlling, etc. Such expressions as this can not be let off on the plea of hasty composition, imperfect proof reading, established usage within a special field, or something of the sort. They mean hazy thinking. Literary form is not a vital thing especially to technical science. Nevertheless, considerable attention to it pays in the long run for effort in this way is promotive of clean, clear thought.

It seems to the reviewer that the word "reaction" is being overworked by some students of animal behavior. What more is there in a medusa's "fishing reaction" than in its plain fishing? And what is the gain in speaking of a bird's alighting on a stake as a "reaction"? There is a quality seemingly possessed in some degree by all minds, that tends to accept a new name for an old familiar phenomenon as in some way more explanatory of that phenomenon than the old name. Anything that encourages this tendency is not good for objective science. More, perhaps, in science than in any other domain of knowledge is there need of vigilance against bondage to words.

The subjects treated in the collection may be ranged under these heads: *Cytology*, *normal development*, *regeneration*, *faunal zoology* and *animal behavior*. Some of the papers fall exclusively under one head while others contain matter belonging to two or more. Such notice and comment as can be made here will be ranged under these headings.

Cytology: H. E. Jordan ("The Germinal Spot in Echinoderm Eggs") concludes that the chromosomes in *Echinaster crassispina* are derived from the nucleolus, and that they arise inconstantly in different species of echinoderms from any part of the germinal vesicle that contains the chromatin material, such containers being either the nucleolus or nuclear reticulum or both, and that nothing in this research supports the theory of individuality of the chromosomes. The same author ("The Spermatogenesis in *Aplopus mayeri*") finds an accessory chromosome in the phasmid studied and believes the "history of this accessory chromosome gives evidence that it at least possessed a strict morphological and probably also a physiological individuality." One would like to know whether this statement implies that there might be

a morphological without a corresponding physiological individuality. If such an individuality is implied it is a queer kind of individuality, or would be for any other bodies than chromosomes. But chromosomes have had so many queer things attributed to them that queerness with them has almost ceased to be queer.

In a third paper ("The Relation of the Nucleolus to the Chromosomes in the primary Oöcyte of *Asterias forbsii*") the same author expresses the belief that "all the hereditary elements are persistently held by the chromosomes . . . and that these merely receive nutritive material from the nucleolus." It may be granted that the figures and descriptions presented show material to be transferred from the nucleolus to the chromosomes. What the evidence is that this material is all nutritive and none of it hereditary would be extremely important. Certainly no such evidence is presented in this paper.

The fourth paper that contains cytological matter is "The Habits and Early Development of *Linerges mercurius*," by E. G. Conklin. The egg of this medusa presents concentric layers, the outermost of which is protoplasm nearly free from yolk. As in the eggs of various other cœlenterates, cell-division, at least the first division, begins in this peripheral layer; but contrary to what has been held for some other species, the nuclei and chromosomes are here somewhat distant from the point at which the first visible changes toward division occur. There seems, consequently, no observational ground for supposing that this outer layer does not actually start up the division. This would appear to be a very significant point. Conklin gets no evidence that cell-division is ever amitotic in this species as it has been reported to be in one or two other cœlenterates.

Normal Development: W. K. Brooks and B. McGlone show ("The Origin of the Lung of Ampullaria") that in the pulmonate studied, the lung seems to be quite a different structure from that of other pulmonates and hence the conclusion is reached that "there is no reason to think that there is any ancestral connection or relation between the lung of Ampullaria and that of the pulminates." In the paper by Conklin noted under cytology, it is shown that gastrulation in the medusa studied usually takes place by invagination, but sometimes by the immigration of a mass of endoderm cells at the vegetal pole, and the author remarks on the close relationship between the

two processes. The off-hand way in which this fact is now treated, as compared with the almost frantic contention of twenty years ago that the two are fundamentally different, at least in phylogenetic significance, may well be reflected upon when our minds are turned toward theoretical biology.

Regeneration: Under this head there are two valuable papers. One ("An Experimental Study of the Rate of Regeneration in *Cassiopea xamachana*") is by Chas. R. Stockard, and the other ("Some Internal Factors concerned with the Regeneration of the Chelæ of the Gulf-weed Crab") is by Chas. Zeleny. Stockard finds no support in this research for the hypothesis that activity of the regenerating part accelerates or influences in any special way the regeneration. By cutting pieces of various shapes and sizes from the bell of the medusa, he gets the interesting result that on the animal itself the "*regeneration rate is fastest from the portion from which most tissue has been removed*"; and on the pieces cut away regeneration is "*fastest from the part from which the least tissue has been removed.*" The reviewer would raise the inquiry, Does not this conclusion say essentially that the *removed tissues of Cassiopea are replaced in the way necessary to effect the quickest and surest restoration of the original form of the animal regardless of the form and place of the cut?*

Zeleny's researches were directed at two fundamental points: "The quantitative determination (1) of the effect of successive removal of an organ upon its power to regenerate and (2) of the character of the changes, if any, produced in the uninjured parts of the animal by such removal." The summarized results are: (1) "When the correction for change in power of regeneration with size or age is made it is found that successive removal neither retards nor accelerates the regeneration of the right chela." The criticism may be ventured that this conclusion is too unqualified for the number of tests made, there having been but three removals of the same chela in the same individual. As we commit ourselves more and more to quantitative methods in biology, we shall see more and more clearly, so it appears, the importance of the principle of "large numbers." On the second object of the research the result was: "The removal and regeneration of the right chela produces no change in the growth of the uninjured left chela."

Faunal Zoology: The titles belonging primarily under this head are: "The Pelagic Tunicata of the Gulf Stream," by W.

K. Brooks; "Notes on the Medusæ of the Western Atlantic," by H. F. Perkins; "Helminth Fauna of the Dry Tortugas," by Edward Linton; "A Variety of *Anisonema vitrea*," by C. H. Edmondson.

A sad interest attaches to the paper by Professor Brooks, it having been published after its author's death. Fitting indeed it is that some of the last works from Brooks's masterly hand should be on the group of animals on which his most distinguished observational researches were made. A few unimportant inadvertencies occur in the paper due to the fact that illness prevented the author from putting his manuscript in final form for publication. Some of the figures of Plate I are labeled *S. florida*, and some *S. floridana*. *Floridana* is the right name. The title is somewhat misleading since no general treatment of the tunicate fauna of the Gulf Stream is contained in the paper. As a matter of fact "observations on certain morphological points in the subgenus *Cyclosalpa*" would have been a better title for the first and second parts of the paper. Perhaps the most important general point discussed by Professor Brooks is that of the similarity between the muscle bands of *Salpa* and *Doliolum*. He had previously tried to dispel the erroneous distinction, as he believed, between the two that is suggested by the terms *Hemimysaria* as applied to *Salpa*, and *Cyclomyaria* as applied to *Doliolum*.

In a third section of the paper written in collaboration with Carl Kellner, a new appendicularian, *Oekopleura tortugensis*, is described. Some "Notes on Embryology" add a little to our meager knowledge of the development of this group of animals.

Perkins's paper on Medusæ is by no means a faunistic study in the narrow sense, it containing quite as much that would come under the head of animal behavior as under that of faunal zoology. One of the new species, *Cladonema mayeri*, is treated at length, not only the hydroid, and medusa forms being fully described, but as well various activities and attitudes being dwelt upon in a lively, appreciative manner. There may be a little danger in speaking of a jelly-fish as "evinced the keenest interest in the prospect of a meal," but such expression has at least the merit of recognizing the coordinated though complex and characterizing activities of the organism under a special stimulus; and at the present time the tendency is to allow lower organisms too little rather than too much of psychic life.

Efforts to secure embryos of *Cassiopea xamachana* were unavailing, no males being found even though over one hundred individuals were examined!

Linton's studies on parasitic worms lead him to the conclusion that generally these organisms are not as abundant either in species or individuals, for an equal number of hosts (fishes) in tropical as in northern waters.

An interesting case of identification is mentioned by Linton. The spiral valve of some shark, with its contents, came to him for study. From the entozoa present, taken with the other intestinal contents, he concluded that the organ belonged to *Galeocерdo tigrinus*. It was later found that the jaws of the specimen had been saved. Examination of these proved the original identification to have been right. Question: Where were the "determinants" of the characters by which this identification was made? Were they in the germ-cells of the shark or in those of the entozoa that inhabited the shark's intestine? Of course the case would present no difficulty to a consistent determinatist because the determinant doctrine is founded (unwittingly) exactly on such an *a priori* basis that observed facts can not touch it. As well expect to hurt a ghost with a charge of buck shot, as the determinant theory with objective facts.

Several new species and genera of endoparasitic worms are described in the paper.

Animal Behavior: Under this head come the largest number of titles and, on the whole, probably the most important observations contained in the volumes. This is as it should be, coming, as the studies do, from a laboratory located by design in a peculiarly rich zoological region that is at the same time remote from the great centers of scientific activity. The titles are: "The Annual Breeding-Swarm of the Atlantic Palolo," by A. G. Mayer; "Rhythmical Pulsation in Seyphomedusæ," by A. G. Mayer; "Habits, Reactions and Associations in *Ocypoda arenaria*," by R. P. Cowles; "Habits, Reactions and Mating Instincts of the Walking Stick, *Aplopus mayeri*," by C. R. Stockard; "A Contribution to the Life-History of the Booby and Man-o'-War Bird," by F. M. Chapman; "The Behavior of Noddy and Sooty Terns," by J. B. Watson; and "An Experimental Field-study of Warning Coloration in Coral-reef Fishes," by Jacob Reighard.

As already indicated, some of the papers noticed under other

heads contain interesting matter that belongs here. This is especially true of Conklin's paper on Linerges. It is practically out of the question to give within the limits of a brief review an adequate summary of the contents of this group of papers. The Atlantic Palolo has been under observation by Dr. Mayer for nine years, and various interesting details in the "swarming" of this species have been made out. Besides the principal swarm (near the last quarter of the moon, between June 29 and July 28) there may be a few smaller swarms before and after this. Experiments indicate that moonlight falling on the rocks in which the worms live is indispensable to the swarming.

Mayer's studies on the pulsation of the medusa of *Cassiopea xamachana* is a continuation of work of his previously reported one. The idea that sea water is a balanced solution for this species, and that the animal manufactures its own stimulant to the rhythmical contractions by the "constant formation of sodium oxalate in the terminal entodermal cells of the marginal sense-organs," is still further dwelt upon. Mayer concludes, in agreement with some other observers working on other animals, that in this species, "conductivity of the subumbrella tissue is independent of contractility. Dr. Cowles's article on the "sand-crab" is especially distinguished at first sight by some of the admirable illustrations it contains. It is shown that this crab, in which one chela is decidedly larger than the other, almost always digs its burrow with the side having the smaller chela and enters the burrow after it is dug, with that side in the lead. This, Dr. Cowles remarks, is probably advantageous to the animal in that the larger chela is in the more favorable position for defense. It would seem that this case might have an interesting bearing on the question whether structures take their characteristic forms to meet demands imposed upon them or are used to the best advantage for the organism after they are in existence. In which service are the chela exercised more, in digging or defending and capturing? Possibly the question might be answered observationally. The investigator concludes that the crabs do not distinguish colors visually and do not hear in the ordinary sense; that they see outlines; that the so-called auditory organs are equilibrating organs; that the tactile sense is well developed; and that the animals have memory and profit by experience, and form habits.

The peculiar structure and habits of the walking-stick,

Aplopous, afford the animals protection in a high degree according to Stockard's investigations. Under certain circumstances when the antennæ are removed the "forelegs are readily pressed into service as feelers." Males were found to copulate even in a dark room with the amputated abdomina of the females.

Chapman gives some interesting information on the domestic and civil polity of the booby and the man-o'-war bird. For example, the male and female booby seem to change off in their home duties, the one staying with the nest for a time while the other fishes. Each pair of birds is closely limited to its own small nest area during the breeding time, the rule being enforced by prompt action on the part of members of the colony generally if a particular individual ventures outside his own precincts. The booby seems to have the habit of laying two eggs, only one of which yields a bird. Although not belonging properly under the present heading, mention may be made of Chapman's observation on the order in which the feathers of pteryllæ appear and the rate at which they grow. This seems to the reviewer an important subject and one deserving more attention than it has received.

Without minimizing the value of the papers so far noticed, the two still unnoticed, namely those of Watson and Reighard, are probably the most valuable of the whole collection, judged by the number and character of the observations recorded. In his introductory remarks Professor Watson refers to his work as preliminary and speaks with some doubt about the possibility of its being continued. From the beginnings made on several problems of the utmost interest, it is greatly to be hoped that the Tortugas Laboratory will see to it as one of its first concerns that these investigations are kept up. To get some clear light on the one problem of how terns which seemingly have never been over the ground before, can find their way from Cape Hatteras to the Bird Key, something like a thousand miles, would amply justify the expenditure of the institution's entire income for a number of years were so heavy an outlay necessary. Fortunately the work would probably not be greatly expensive. Biologists will do well to recognize that exactly in such phenomena as these occultism and superstition have their strongest roots to-day, and that these roots are by no means frail and sickly. Any victory that science can win in these frontier regions counts for more toward the general enlightenment of

mankind than many won in already well cultivated conquered territory. For the many facts brought out on the relation of the sexes during the breeding period; on the care of progeny; on the instincts and habits of the young; on the intelligence, individual and comparative, of the two species studied; and many other topics, the paper itself must be consulted.

Reighard's investigation being in a field that has long been a storm-center of theoretical biology, will probably attract more readers than any other one in the volumes. In the reviewer's opinion it will, too, exercise a wide and beneficent influence toward rectifying one of the most remarkable aberrations to which scientific speculation has been subject in any domain of science for many a decade. It was the reviewer's privilege a few years ago to spend some time observing the fishes about the coral-reefs of the Hawaiian Islands. From this experience as well as from various others more or less kindred, he is convinced of the essential soundness of Reighard's results. More than that, he is convinced that any naturalist, the windows of whose mind are not darkened with the heaviest screens of adverse dogma, would be likewise convinced were he to examine the evidence for himself.

We must be content with a single quotation from this paper:

Coral-reef fishes are not conspicuous because they are in the reefs; they are in the reefs because they are conspicuous and can not therefore leave the reefs, and because, being in the reefs and taking food as they do, there is no reason for their being inconspicuous. The reefs condition their conspicuousness; they are in no sense its cause.

We should certainly want more light than the author has given on the meaning of the statement that reefs condition but in no sense cause the conspicuousness of the fish. But passing this as of minor importance it is to the first part of the statement that we turn for the real meat of the case. If it be really true, and we recognize the truth, that the color of these fishes has arisen we know not how, but that having become thus elaborate and conspicuous, the fishes find protection as well as food among the corals, then are we at the threshold of the problem of how the color has arisen, with our senses and wits open to receive evidence of whatever sort bearing on the problem. The unfortunate thing about the natural selection theory has been not so much the error it contains as the fact that it has been made an *absolutist theory*; one of the sort, that is, that *shuts the*

door in the face of inductive science. It is time to be undeceived in this matter.

WM. E. RITTER.

LA JOLLA, CALIF.,
Sept. 20, 1909.

EXPERIMENTAL ZOOLOGY

Inheritance of Color in Pigeons.—The breeding experiments of pigeons, described by R. Staples-Brown in the *Proceedings of the Zoological Society of London* for 1908, pages 67–104, are of interest because he repeated certain experiments by which Darwin obtained a reversionary type resembling *Columba livia*. Darwin concluded that domesticated pigeons sprang therefore from the wild rock pigeon. The varieties of pigeons used by Staples-Brown were with one exception identical with those used by Darwin and the experiments were planned on similar lines. Darwin's experiment, it will be recalled, was as follows:¹ A black Barb was crossed with a white Fantail and a black Barb with a red Spot (white bird with tail and tail coverts red having a red spot on the forehead). Upon mating hybrids produced by these two crosses Darwin obtained a pigeon identical with *Columba livia*, excepting that "the head was tinted with a shade of red, evidently derived from the Spot, and was a paler blue than in the rock pigeon." Staples-Brown substituted a black and white Nun for Darwin's red Spot which was not readily obtainable.

A Nun is a white bird with certain well-defined markings of black, blue, red or yellow. The individuals used in Staples-Brown experiments were black and white, the black appearing on the chin and throat, part of the outer flight feathers, a few secondaries and tertiaries, the tail and upper and under tail coverts. The Barb pigeon is self-colored, black, red, yellow, dun or white, with a small beak and the skin around the eyes broad and carunculated. Black Barbs only were used in these experiments. The Fantails used were white. When the Barb $\times$ Fantail hybrids were bred to the Barb $\times$ Nun hybrids no reversionary types were produced. These experiments were discontinued owing to lack of space. However, when Barb $\times$ Fantail hybrids were mated together some of the offspring had blue feathers. The blue color was chiefly on the tail as described by

¹ "Animals and Plants under Domestication," 2d edition, Vol. I, p. 209.